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CHAPTER K

CITY OF CORONADO

PUBLIC SAFETY & SEISMIC SAFETY ELEMENT

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PUBLIC SAFETY AND SEISMIC SAFETY ELEMENT

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PUBLIC SAFETY AND SEISMIC SAFETY ELEMENT

CHAPTER ONE: INTRODUCTION

It is the objective of the Safety and Seismic Safety Element of the General Plan to introduce safety and seismic safety considerations in the planning process in order to reduce loss of life, injuries, damage to property, and economic and social dislocation resulting from fire, dangerous geologic occurrences and seismic events. The element, then, is a policy statement by the City which should consider the following:

1. Safety and seismic hazards and their possible effect on the community.
2. Identification of methods for reducing hazard and seismic risk.
3. Identification of the level of acceptable risk.
4. Determination of priorities for abatement of safety hazards.
5. Evaluation of disaster planning programs.
6. Determination of specified land use standards related to level of hazard and risk.
7. Maps, as needed, to delineate natural hazards including the location and extent of known geologic hazards.

The study area includes all land and water areas within the City of Coronado (see Figure 1). The study area is bounded by the City of San Diego on the east and north, by the City of Imperial Beach on the south, and by the Pacific Ocean on the west.

Although not within the city limits of Coronado, the Naval Air Station, North Island has been included in the study area (see Figure 1). The geographic location of the Air Station and the potential impact on emergency plans requires that this area be included in the study.

TOPOGRAPHY

All of the developed portions of the study area are characterized by a very gently sloping topography with most areas being quite level. The maximum elevation for the developed area is on the order of 25 feet above sea level while the area occupied by the Naval Radio Receiver Facility rises to a maximum elevation of about 40 feet.

FAULTING

There is no known fault activity on the land portion of the study area. However, investigations have inferred the location of faults in San Diego Bay which could be an extension of the Rose Canyon Fault which can be considered potentially alive.

GEOLOGIC HAZARDS

The following seismically induced geologic hazards are to be found in the study area: the potential for severe ground shaking, liquefaction during severe earthquake and the effects of tsunamis (seismic sea waves).

DEVELOPMENT

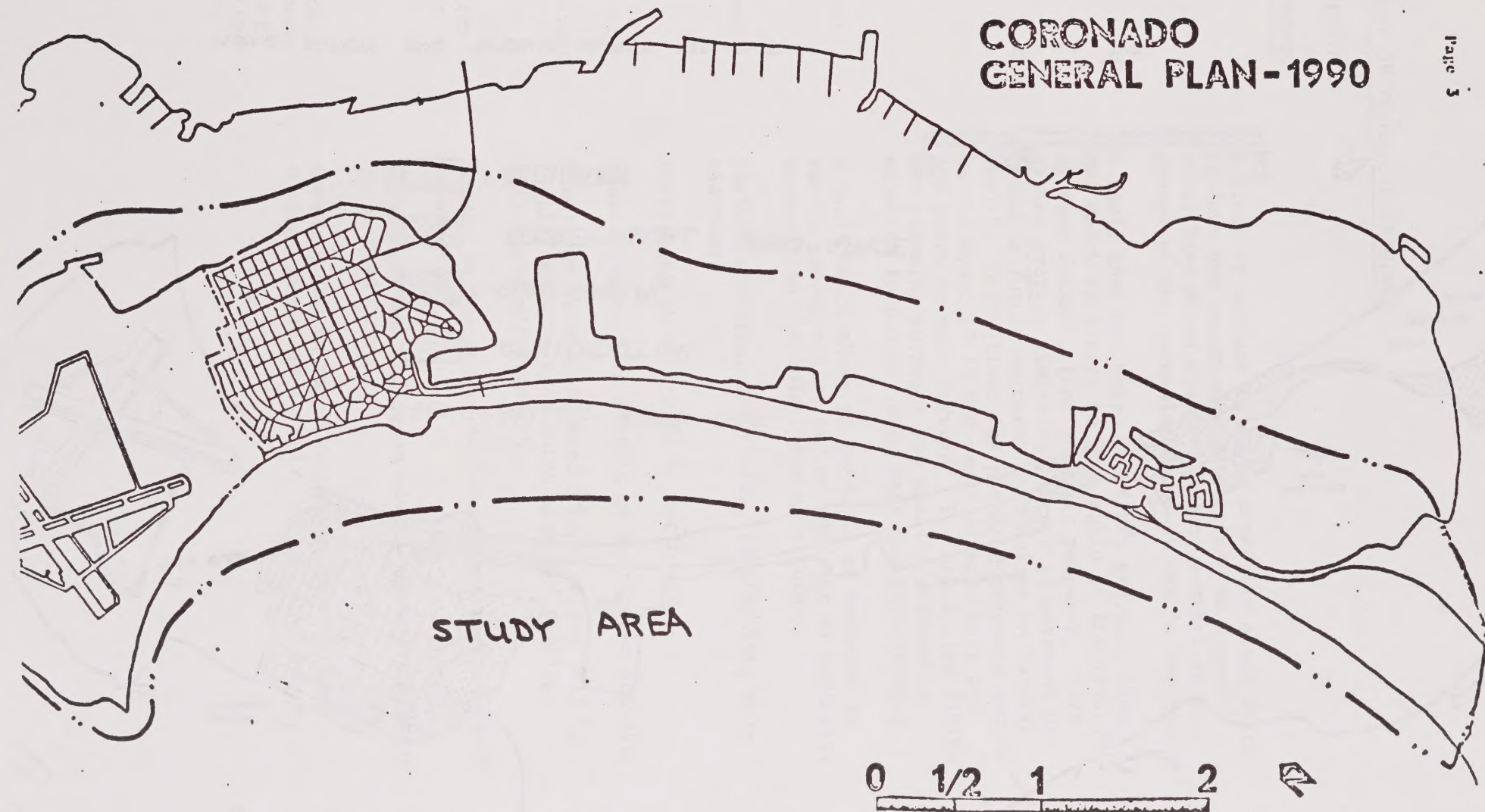
The land portion of the study area is developed with predominantly residential structures. The residential and commercial area is concentrated in the area known as "Coronado Island" with a second concentration along the Silver Strand known as military housing and the Coronado Cays (see Figure 2).

Major open spaces are located on the Naval Air Station, North Island, the Silver Strand and the Naval Radio Receiving Station (see Figure 2). These areas will not be developed in the foreseeable future.

The Public Safety and Seismic Safety Element is designed to serve the needs of an already highly developed area. The City of Coronado can, by adopting and enforcing appropriate ordinances, reduce the potential loss of life, injury, and property damage caused by seismic events or safety hazards.

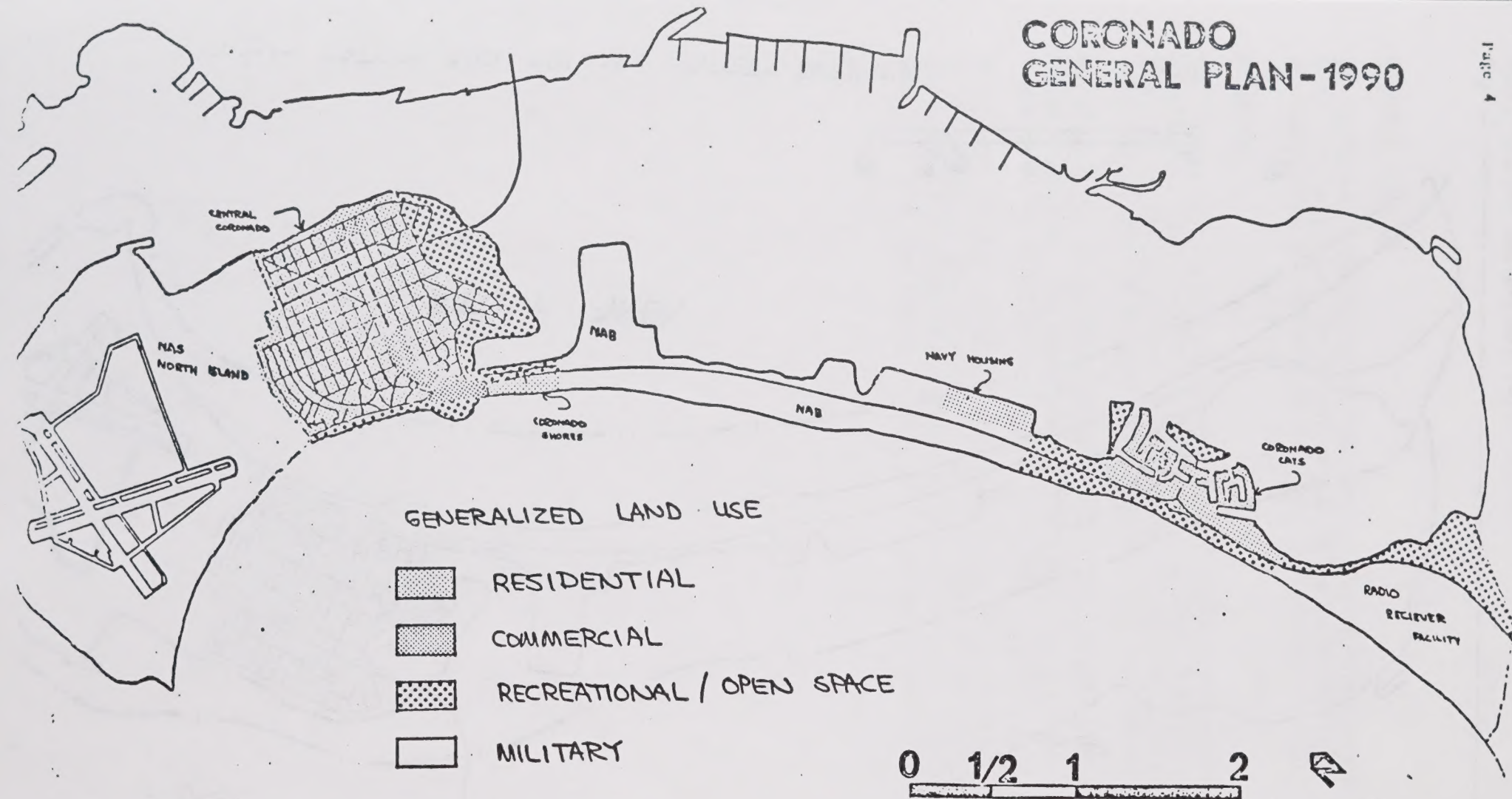
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PUBLIC SAFETY AND SEISMIC SAFETY ELEMENT

Figure Two

CHAPTER TWO: SUMMARY OF TECHNICAL FINDINGS

GEOLOGIC HAZARDS FINDINGS

1. DEFINITION OF TERMS

Fault:	A plane or surface in earth materials along which failure has occurred and materials on opposite sides have moved relative to one another in response to the accumulation of stress in the rocks.
Fault, Active:	A fault that has moved in recent geologic time and which is likely to move again in the relatively near future. (For geologic purposes, there are no precise limits to recency of movement or probable future movement that define an "active fault". Definitions for planning purposes extend on the order of 10,000 years or more back and 100 years or more forward. The exact time limits for planning purposes are usually defined in relation to contemplated uses and structures.)
Fault, Inactive:	A fault which shows no evidence of movement in recent geologic time and no evidence of potential movement in the relatively near future.
Ground Failures:	Include mudslide, landslide, liquefaction, subsidence.
Seismic:	Pertaining to or caused by earthquake.
Seismic Hazards:	Hazards related to seismic or earthquake activity.
Soil Liquefaction:	Change of water saturated cohesionless soil to liquid, usually from intense ground shaking; soil loses all strength.
Surface ruptures from faulting:	Breaks in the ground surface resulting from fault movement.
Tsunamis:	Earthquake-induced ocean waves, commonly referred to as tidal waves.
Tectonic, forms, forces, and movements resulting from deformation of the earth's crust:	Movement may be rapid resulting in earthquake, or slow (tectonic creep).

2. MAJOR FAULT ZONES (Figure Three)

A fault zone is a group of fractures in bedrock which may extend upward to the ground surface and along which there has been displacement of the two sides relative to one another. Available data indicate that there are three major regional zones of faulting within the San Diego region. From east to west these are:

The San Jacinto fault zone, located in the eastern part of the county, is considered to be the major active branch of the San Andreas fault system.

The Elsinore fault zone, paralleling the San Jacinto fault zone, has no known connection with the San Andreas fault system.

The Rose Canyon fault zone, paralleling the Pacific coastline, is considered to be the possible southeasterly extension of the Newport-Inglewood fault zone, which was the source of the damaging 1933 Long Beach earthquake. For hazard evaluation purposes, the Sweetwater and La Nacion faults are included in this third zone. These faults are possibly of critical importance because they traverse areas which are presently urbanized as well as areas in the path of future urban expansion.

In addition to these three principal zones, there are other faults and fault-related structures in the north, central and eastern parts of the region. Recent high altitude photography and radar imagery have revealed additional prominent linear features that are suggestive of fault origin. These lineaments have not yet been adequately evaluated, and future investigations will be necessary to determine if these features are faults.

As indicated previously, there are no known faults within the study area. Further investigation should reveal if the Rose Canyon Fault does extend into San Diego Bay which has had recorded seismic events in recent time (1964). In addition, many undetected faults, within the County, may be found as existing geologic mapping programs proceed and future mapping programs are undertaken. Such mapping and study remain to be done before a satisfactory understanding of fault distribution and activity can be achieved.

3. GROUND SHAKING (Figure Four)

Ground shaking is the oscillation or vibration of earth materials resulting from an earthquake. It is the most commonly experienced earthquake phenomenon because it may be felt tens or hundreds of miles from the earthquake epicenter.

Ground shaking hazards are most likely to occur in areas, such as Coronado, underlain by loose, water-saturated, unconsolidated materials commonly referred to as deposits. The severity and type of ground shaking depends on several factors including: (1) earthquake magnitude and duration; (2) distance from faulting activity, earthquake origin; (3) local subsurface conditions; (4) building type and design; and (5) type of construction material used.

The Comprehensive Planning Organization, General Lithology and Earthquake Potential Map shows the Coronado Study area to be made up of Terrace Deposits which are poorly consolidated or unconsolidated aggregates of silt, sand and gravel. There is high potential for earthquake damage to structures located on this material.

4. GROUND FAILURE (Figure Five)

The following geologic hazards are considered to have the potential for occurrence in the study area:

Liquefaction: Liquefaction is a rather common occurrence during major earthquakes and results from the loss of all strength in water-saturated cohesionless soil because of intense ground shaking. The effect on buildings is severe, with extensive damage resulting from settling, tilting, and floating.

Lateral Spreading: Lateral spreading is caused by ground shaking that triggers the movement of soils towards an unsupported surface or slope (not necessarily steep). Extensive damage to buildings can result from the mass flow of land areas, particularly along waterfront areas and on soft, saturated clays.

Differential Settlement: The occurrence of differential settlement has been well-documented in many major earthquakes and results from the non-uniform settlement of loose and medium-dense granular soils during ground shaking. Differential settlement often results in serious structural damage to buildings and underground utilities.

A general lack of available data precludes a detailed evaluation of ground failure hazards in the study area. A review of the data that have been collected and a review of the history of seismic events in the San Diego region has not revealed any documented instance of ground failure, other than that of landslides. It should not be concluded, however, that ground failure may not occur due to future seismic activity. It is likely that the soil and ground water conditions in the coastal areas, bay margins, and especially the bay fill areas are places for the potential hazards identified above.

5. SEISMICALLY TRIGGERED FLOODING (Figure Six)

Tsunamis, or seismic sea waves, are oceanic waves that are generated by earthquakes, submarine volcanic eruptions or large submarine landslides. As tsunami enters shallower waters along coastlines, wave velocity diminishes and wave height increases. Tsunamis affect coastal areas and coastal watercourses. Documented tsunami history reveals that the largest such seismic sea wave to reach the San Diego coastline has a run-up height of 4.6 feet (1960 Chile earthquake). Available information suggests, then, that tsunamis are not likely to strike the coastal areas of this region; however, the past record is probably too short to be conclusive. The threat of a tsunami should be considered a hazard for the study area. Until further studies develop detailed estimates of potential run-up, the ten-foot contour will provide reasonable estimate of potential run-up elevation.

Another hazard, associated with tsunamis, would be waves generated by an impulsive source such as an offshore localized seismic disturbance. Such waves are of concern since they lie between wind-wave and tsunami-wave spectra and that the warning time for such an event would be substantially shorter than that for a tsunami. The model run-up conducted by the Army Corps of Engineers of this hazard shows that such waves could cause extensive inundation of the Silver Strand, the City of Coronado, and part of North Island.

STRUCTURAL HAZARDS FINDINGS

State regulation with regard to building and earthquake shaking was begun following the 1933 Long Beach earthquake. The Field and Riley Acts were passed that year and the State Office of Architecture and Construction was established under the Department of General Services. The Field Act placed the design of schools under the direct supervision of the Office of Architecture and Construction. The Riley Act placed design requirements on other buildings used for human occupancy except dwellings designed for two families or less. The Uniform Building Code began containing seismic design standards in 1943, however, at that time, plan checking and enforcement were negligible in most cities.

In order to assess the extent of structural hazards in the study area and to develop a program to abate structural hazards, a survey of non-residential and large scale residential buildings (5 units or larger) should be undertaken. The information sought by the survey would include location, date built, and type and size of construction, as well as information about soil and foundation, emergency services, parapets, the quality of maintenance and anything else that would determine general performance of a building in an earthquake. As a general rule, older (especially pre-1933) structures are likely to be of substandard construction in relation to existing and proposed standards. Based on the known behavior of structures during past earthquakes, those structures most likely to collapse or be extensively damaged during earthquakes are (greatest likelihood first): Type III buildings with unreinforced masonry bearing walls; Type IV and V buildings with unreinforced masonry veneer; Type III with reinforced concrete bearing walls; and Type I and II buildings with unreinforced masonry curtain and filler walls.

The survey should stress the potential hazards for critical public and private buildings and other structures such as the following:

1. Emergency Facilities (hospital, private medical clinics, fire and police stations).
2. Involuntary Occupancy Facilities (hospital, nursing home, schools).
3. Utilities (water storage facilities, electric lines, telephone lines).
4. Communication and Transportation Facilities (telephone building, highways, bridges).
5. Parapets and Appendages (cornices, ornamental fixtures and other similar structures that could collapse if not adequately supported).

DISASTER PREPAREDNESS FINDINGS

The City of Coronado and San Diego County have done much disaster, safety, and emergency planning. The Emergency Plan of the City of Coronado was adopted by the City in January, 1974, and is a constituent part of the Emergency Plan of the Unified San Diego County Emergency Services Organization. Prior to the adoption of this plan, the City Council had adopted the California Master Mutual Aid Agreement, dated December 5, 1950 and had adopted Emergency Services Ordinance No. 1266, dated August 15, 1972.

Possible disaster events in the San Diego region are listed in Table I. Appropriate actions for readiness and response to most of these disasters has been prepared by the San Diego County Office of Emergency Services.

FLOOD POTENTIAL FINDINGS (Figure Eight)

Another source of possible damage hazard is from flooding as a result of heavy rainfall. In general the developed areas of Coronado have adequate drainage facilities to prevent flooding during "normal" rainstorms. There are, however, several areas in the City which are subject to inundation during heavy rainfalls (2 to 3 inches in 24 hours). Figure Eight shows the areas which are subject to flooding. The U.S. Army Corps of Engineers is currently preparing a flood potential map and when this becomes available it should be included in this element.

Coronado also has problem with a high water table. The average water table for the City would be 8 feet with some areas only having a 2 foot water table. During peak rainstorms the two foot areas would be subject to ground saturation and flooding.

TABLE I
Possible Disaster Events by Condition and Type

Type	Condition 1 Build-up (Hours to Days)	Condition 2 Sudden (1 to 8 hours)	Condition 3 Instant (Surprise Event)
Geologic and Seismic Hazards	Flood	Landsliding Tsunamis (Tidal Wave)	Earthquake Volcanic Hazards
Weather and Fire	Hurricane Natural Fire	Hail Storm Severe Fog Frost/Frezes Multiple Fires (Arson)	
Industrial Accidents	Radiation Hazard	Radiation Hazard	Chemical Accident Transport Accident Gas Main Break Industrial Explosion Harbor Explosion Pipeline Explosion Radiation Hazard
Failure of Life Support Services	Epidemic Oil Spill	Power Blackout Water Shortage/ Contamination Oil Spill Air Pollution	Total Power Blackout
Special Events	National Emergency	Civil Disorder National Emergency	Bomb Threats National Emergency

Reference: W-26 Natural Disaster Readiness Outlines

Summary on Organization and Plans, San Diego County Office of Emergency
Services, May, 1973

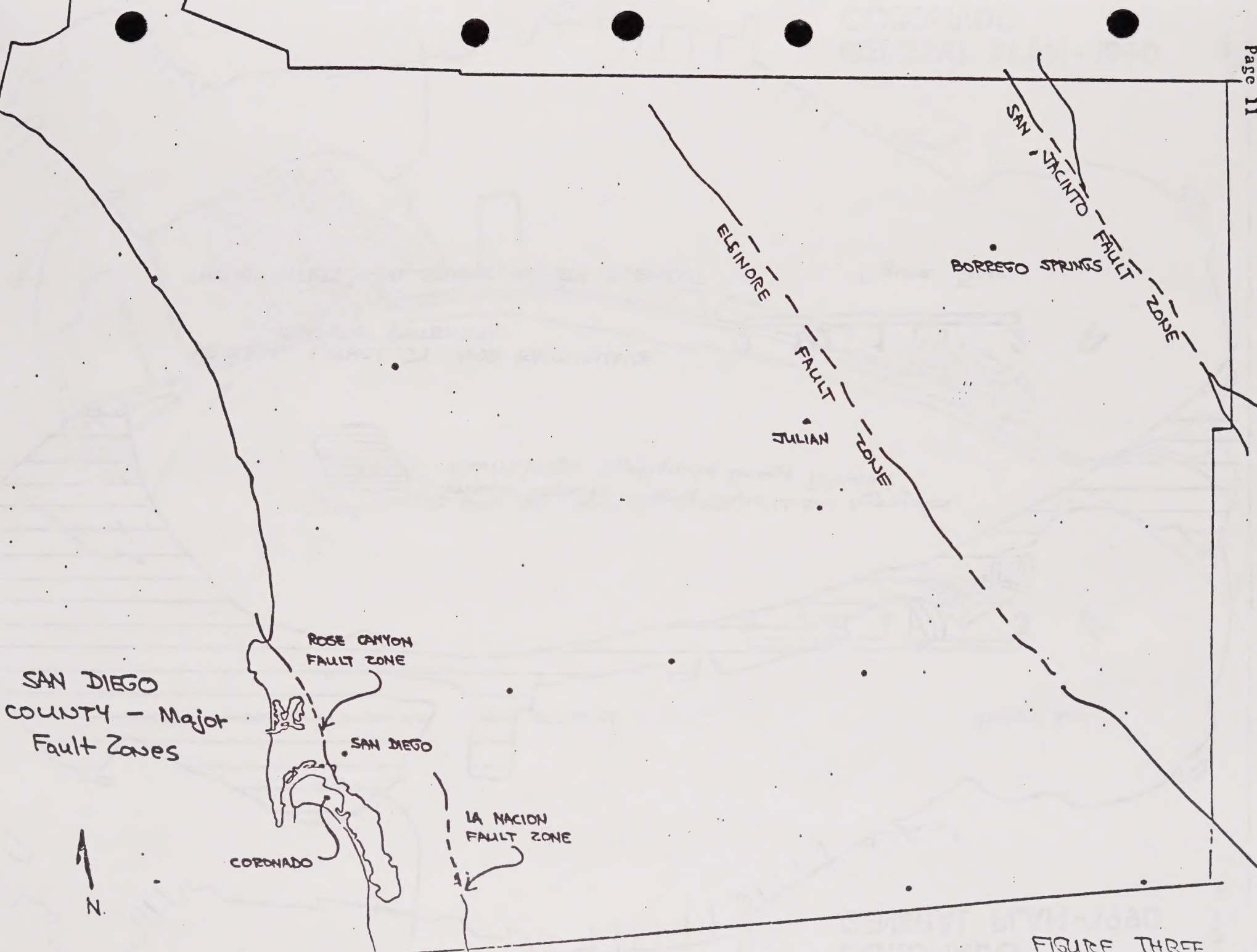
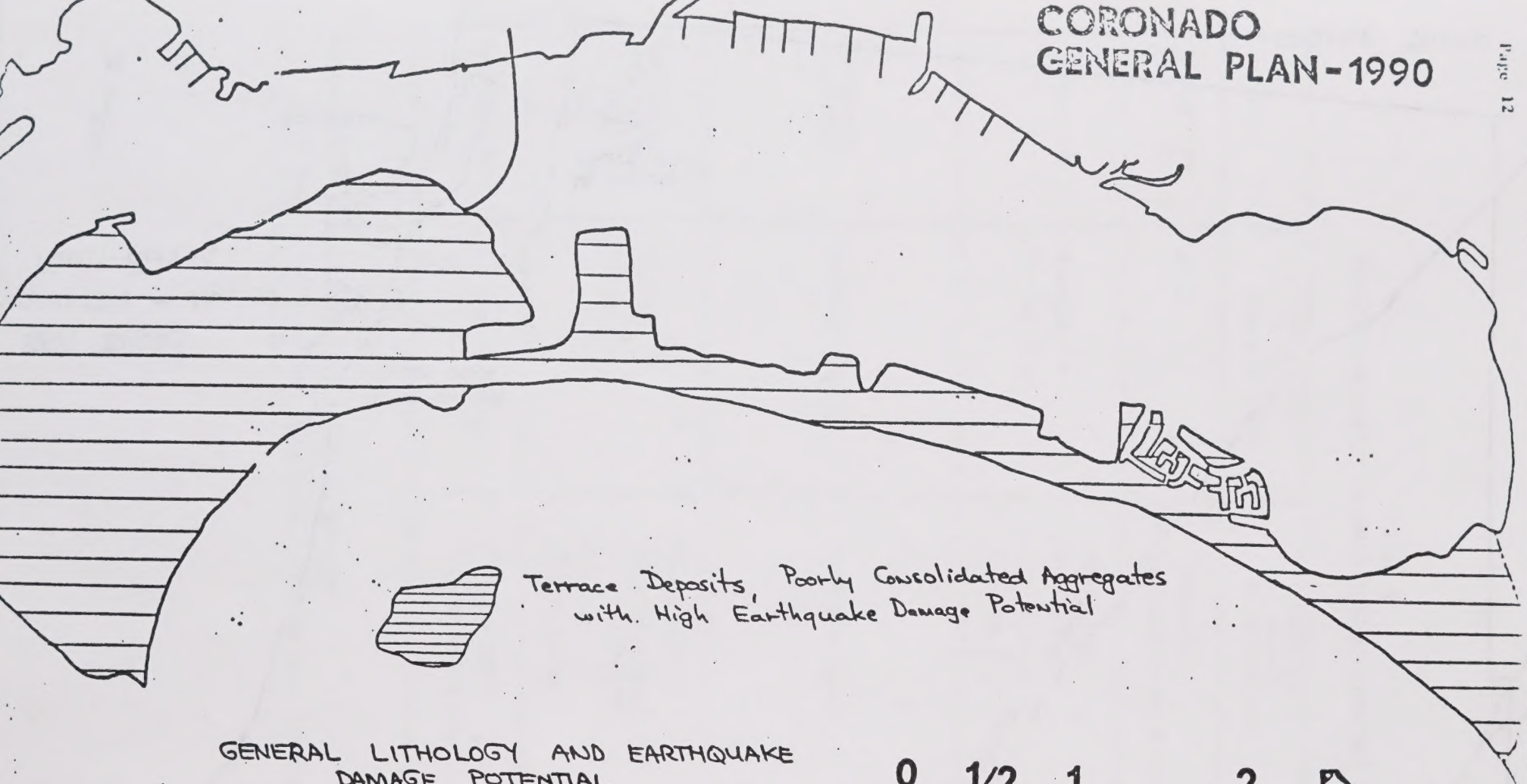
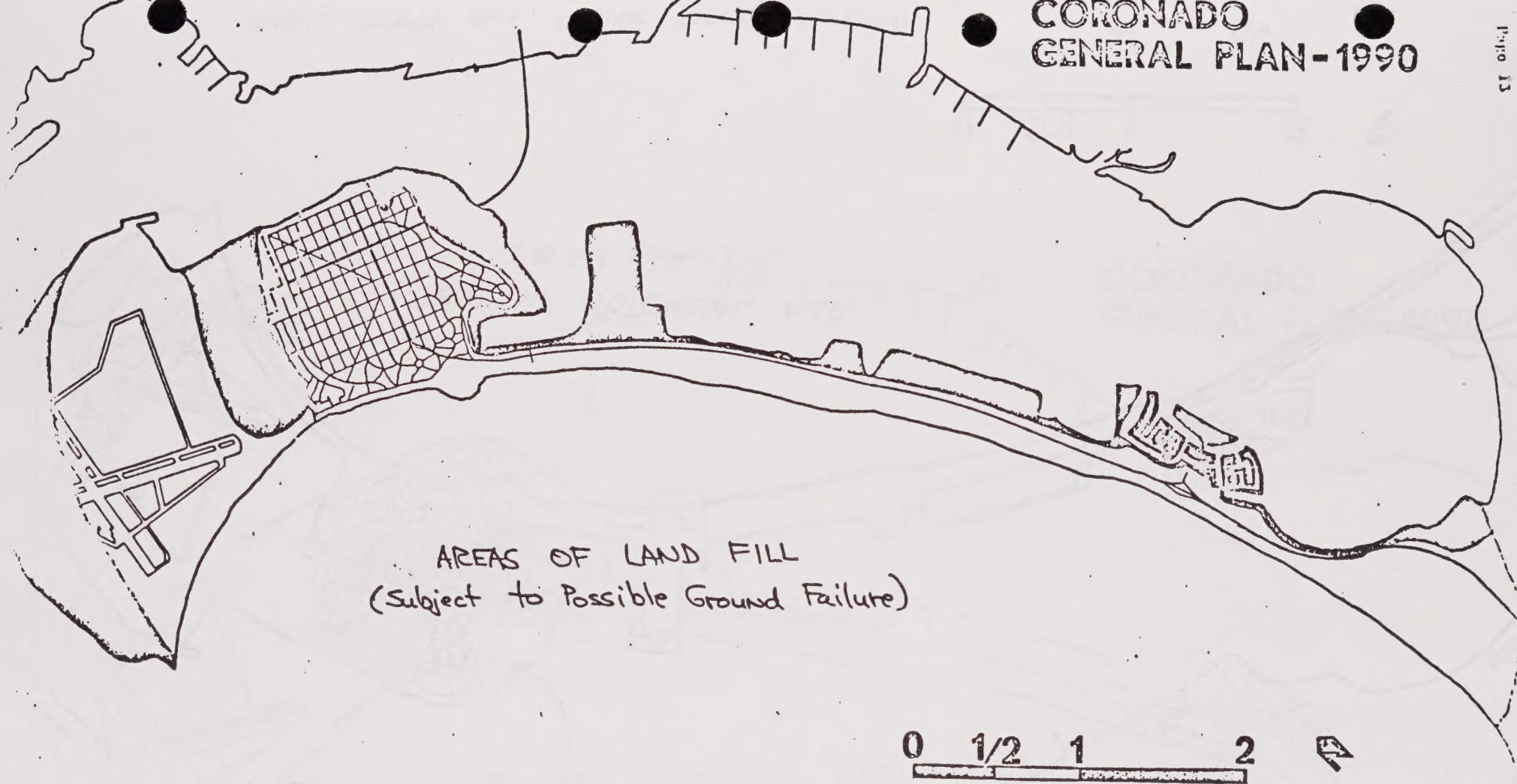


FIGURE THREE

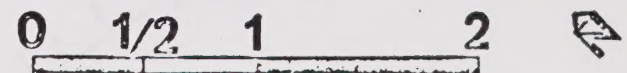
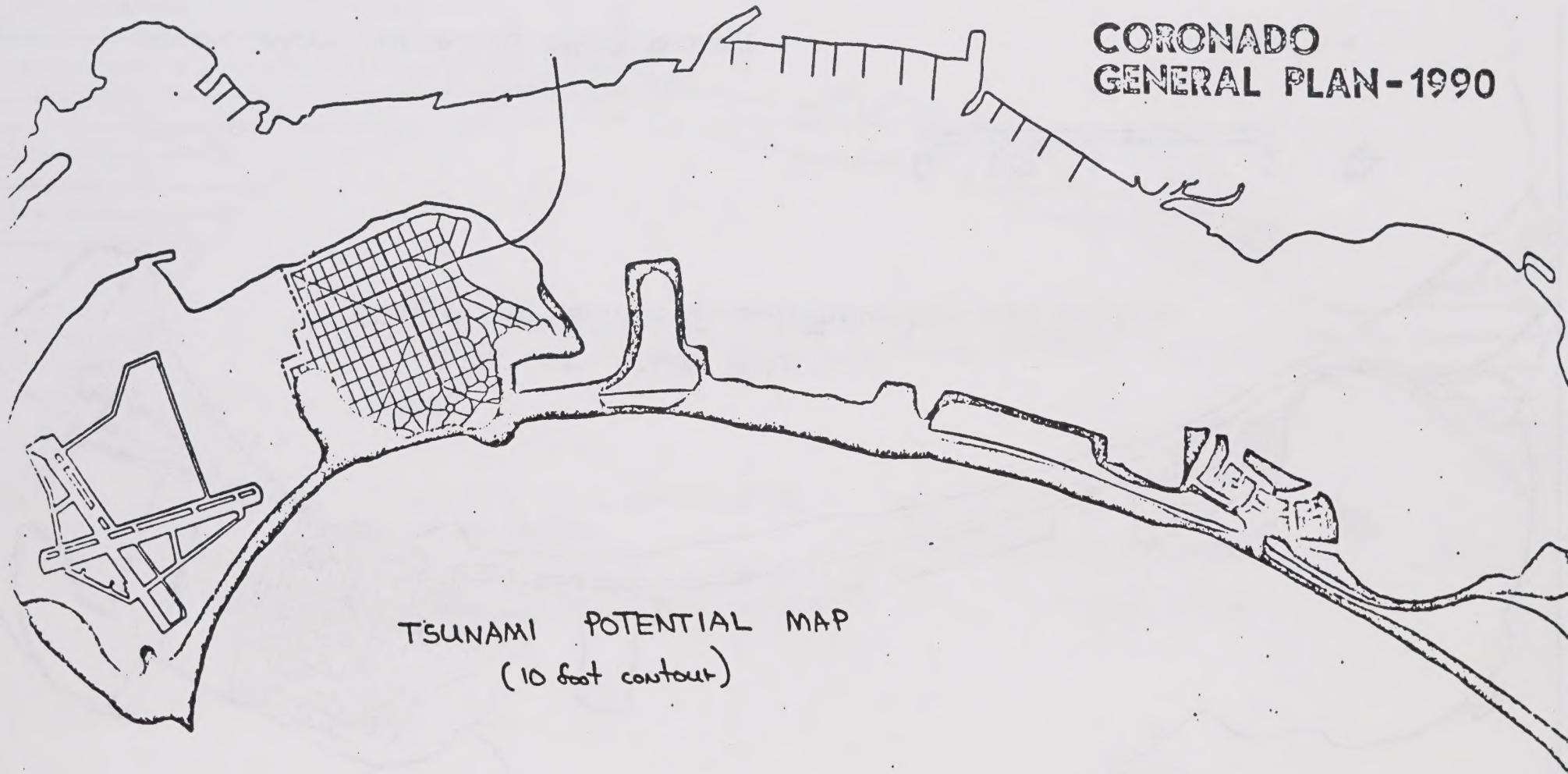


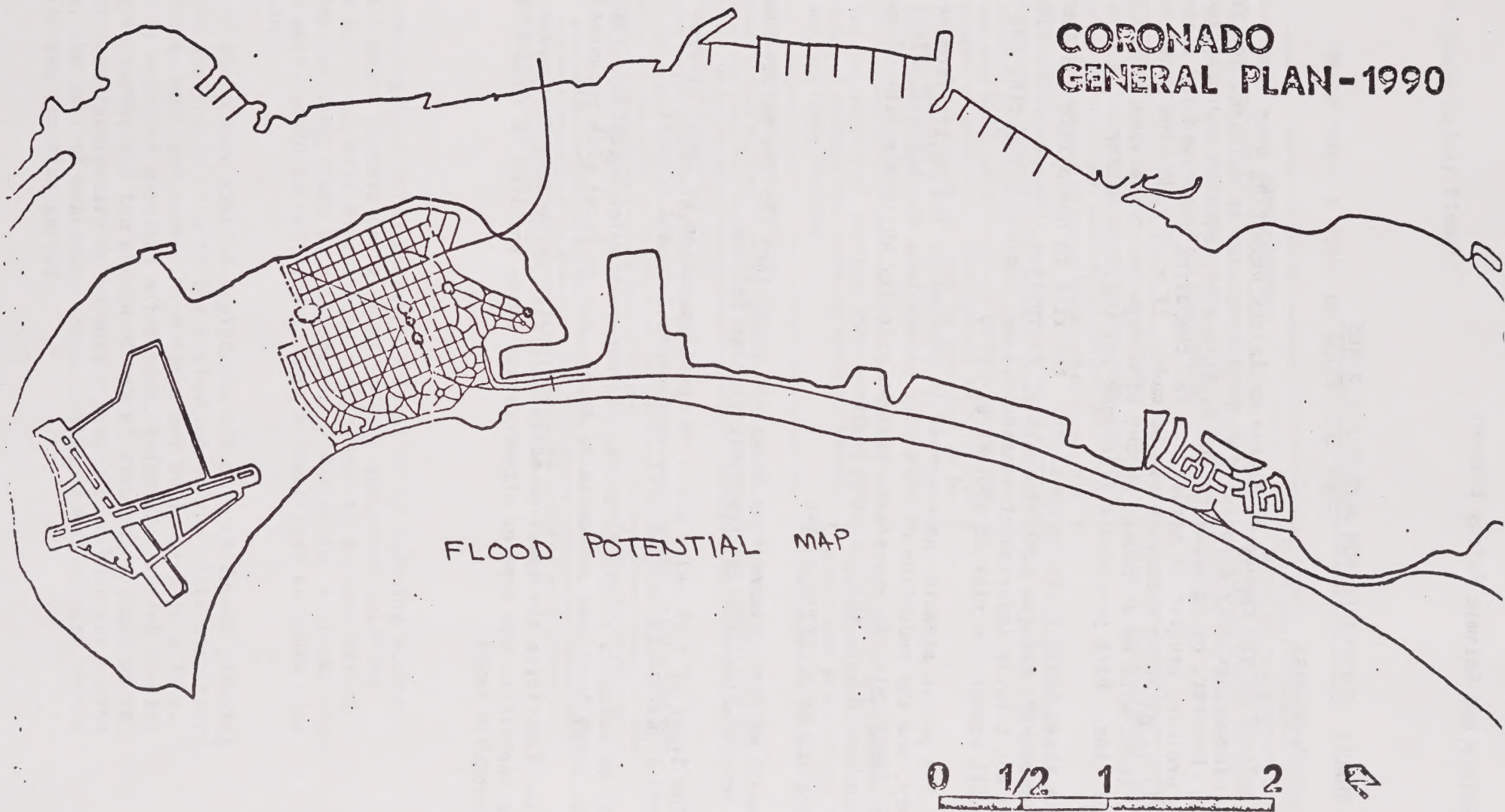


SEISMIC SAFETY AND PUBLIC SAFETY ELEMENT

FIGURE FIVE

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CHAPTER THREE: GUIDELINES FOR ACCEPTABLE RISKS

CONSIDERATION OF RISK

Risk is defined as the chance of damage or injury occurring over some period of time. The uncertainty associated with risk results in difficulties for planners. However, by identifying the risks associated with any proposed or existing project, program or structure, and comparing them with the risks of alternatives, planning decisions can be made. If risk reduction measures are adopted, there will be a reduced amount of damage and casualties over a given period of time. Risk provides a framework for decision making.

There are three basic risks to consider: the risk to human life and limb, the risk to property, and the risk of societal disruption. These are distinct although not totally independent considerations. Normally reducing the risk of one will reduce the risk of another as well.

Clearly the public agencies have a role in protecting the public from death or injury, and the reduction of this risk should have the highest priority. Property damage risk is the second highest priority while the risk of public disruption would have the lowest priority.

CONSIDERATION OF ACCEPTABLE RISK

The Council of Intergovernmental Relations guidelines for the Safety Element of the General Plan defines acceptable risk as follows:

"The level of risk below which no specific action by local government is deemed to be necessary to protect life and property."

The City of Coronado should determine its own particular acceptable risk levels based on local land uses and building types, and on local risk potential.

Table Two identifies the level of acceptable risk using four categories as well as identifies the type of structure and costs required to reduce risk to the acceptable level.

TABLE TWO: A SCALE OF ACCEPTABLE RISK

Level of Acceptable Risk	Kinds of Structures	Extra Project Cost Probably Required to Reduce Risk to an Acceptable Level
1. Extremely low ¹	Structures whose continued functioning is critical, or whose failure might be catastrophic: nuclear reactors, large dams, power intertie systems, plants manufacturing or storing explosives or toxic materials	No set percentage (whatever is required for maximum attainable safety)
2. Slightly higher than under level 1 ¹	Structures whose use is critically needed after a disaster: important utility centers; hospitals; fire, police, and emergency communication facilities; fire stations; and critical transportation elements such as bridges and overpasses; also smaller dams	5 to 25 percent of project cost ²
3. Lowest possible risk to occupants of the structure ³	Structures of high occupancy, or whose use after a disaster would be particularly convenient: schools, churches, theaters, large hotels, and other high-rise buildings housing large numbers of people, other places normally attracting large concentrations of people, civic buildings such as fire stations, secondary utility structures, extremely large commercial enterprises, most roads, alternative or noncritical bridges and overpasses.	5 to 15 percent of project cost ⁴
4. An "ordinary" level of risk to occupants of the structure ^{3,5}	The vast majority of structures: most commercial and industrial buildings, small hotels and apartment buildings, and single family residences.	1 to 2 percent of project cost, in most cases (2 to 10 percent of project cost in a minority of cases) ⁶

¹ Failure of a single structure may affect substantial populations.

² These additional percentages are based on the assumption that the base cost is the total cost of the building or other facility when ready for occupancy. In addition, it is assumed that the structure would have been designed and built in accordance with current California practice. Moreover, the estimated additional cost presumes that structures in this acceptable-risk category are to embody sufficient safety to remain functional following an earthquake.

³ Failure of a single structure would affect primarily only the occupants.

⁴ These additional percentages are based on the assumption that the base cost is the total cost of the building or facility when ready for occupancy. In addition, it is assumed that the structures would have been designed and built in accordance with current California practice. Moreover the estimated additional cost presumes that structures in this acceptable-risk category are to be sufficiently safe to give reasonable assurance of preventing injury or loss of life during an earthquake, but otherwise not necessarily to remain functional.

⁵ "Ordinary risk": Resist minor earthquakes without damage; resist moderate earthquakes without structural damage, but with some non-structural damage; resist major earthquakes of the intensity or severity of the strongest experienced in California, without collapse, but with some structural as well as nonstructural damage. In most structures, it is expected that structural damage, even in a major earthquake, could be limited to repairable damage. (Structural Engineers Association of California).

Another means of reducing risk to an acceptable level is by reducing occupancy of a structure. All other factors being equal, a high occupancy building (such as an office building) will expose many more people to a given hazard than a low occupancy building (such as a warehouse). Therefore, high occupancy buildings and land uses should be required to have a lower risk exposure than those of low occupancy.

The determination of acceptable risk is applicable not only to future planning decisions, but it is applicable also to the evaluation of the risks associated with existing buildings and land uses. High risks may be lowered to a level of acceptable risk by means of physical alteration, relocation and/or demolition of existing structures, and the change of use of structures (such as reducing occupancy or from involuntary to voluntary presence). Whatever course of action is taken, the cost of achieving the acceptable level of risk should be commensurate with the benefits gained.

CHAPTER FOUR: RECOMMENDATIONS FOR SEISMIC RISK AND SAFETY HAZARDS REDUCTION

MAINTENANCE AND DISSEMINATION OF SEISMIC SAFETY AND PUBLIC SAFETY INFORMATION

1. PUBLIC SAFETY AND SEISMIC SAFETY ELEMENT

It is recommended that the City Council appropriate sufficient money so that this element can be distributed to interested groups and individuals in the community.

2. DISSEMINATION OF PUBLIC SAFETY AND SEISMIC SAFETY INFORMATION

Geologic and structural hazard information relating to private development should be readily available. The City should establish a procedure for informing residents, businesses, property owners and prospective property owners of public safety hazards.

3. MAINTENANCE OF PUBLIC SAFETY AND SEISMIC SAFETY INFORMATION

The City Planning Department will maintain a well organized collection of information of all public matters pertinent to public safety and seismic safety hazards within the City and will seek out and collect all such information.

4. COLLECTION OF STRUCTURAL HAZARDS INFORMATION

The City Building Department will catalog information pertaining to structural hazards in the City. This should include all known hazards over a period of years.

DISASTER PREPAREDNESS PROGRAM

1. CITY OF CORONADO AND SAN DIEGO COUNTY DISASTER PREPAREDNESS PROGRAM

The City of Coronado Emergency Plan and the Unified San Diego Emergency Services Agreement provides the City with an adequate response to most natural and man-made disasters. These plans provide the City with a program which is the basis for conduct and coordination of operations and the management of critical resources during an emergency.

2. DEVELOPMENT OF A TSUNAMIS WARNING SYSTEM

Because of its location and low topography, the City of Coronado is susceptible to damage from tsunamis. The forces involved are so great that the only positive means of protection is to avoid areas subject to tsunamis. Since much of this area has been developed, it is recommended that the City establish a communication link with the seismic sea-wave warning system administered by the National Oceanic and Atmospheric Administration. Warning times vary with distances from the source, but periods of several hours usually are available to evacuate populations to safe areas.

SAFETY MANAGEMENT ZONES

The City should develop Safety Management Overlay Zones. These zones would identify and map areas which are subject to seismic hazards; such as soil liquefaction, lateral spreading, differential settlement and tsunamis. These zones would also prescribe development standards and a structural abatement program to insure an acceptable level of risk. At this time the geologic data available is not sufficient to determine the location of these zones, and when this information is available the City should proceed to develop these zones. Until more information is available it is also recommended that, for planning purposes, the City adopt the 10 foot elevation contour as a reasonable estimate of potential tsunamis run-up.

STRUCTURAL HAZARDS ABATEMENT PROGRAM.

In developed areas, such as Coronado, where planning for future land use of undeveloped areas is already substantially precluded, the most appropriate means of reducing hazard risks would be the elimination, renovation or change in use of structures likely to sustain substantial damage, become non-functional, or pose a threat to the public health and safety.

The City adopted the "Uniform Code for the Abatement of Dangerous Buildings" - 1973 Edition - on October 16, 1973. This Code provides for a "just, equitable, and practicable method", whereby buildings or structures which endanger the "life, limb, health, morals, property, safety or welfare of the general public, may be required to be repaired, vacated, or demolished". Unfortunately, this code does not have an implementation program and structures are not being periodically inspected on a comprehensive basis. It is recommended that the City Council initiate an implementation program.

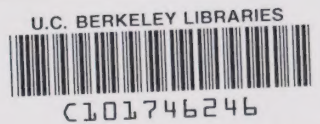
SPECIFIC PLANS

Specific Plans are detailed plans prepared for designated areas of the City, which can indicate the exact location of structures, open spaces, streets, etc. within the area, and which "...shall include all detailed regulations, conditions, programs and proposed legislation which shall be necessary or convenient for the systematic implementation of each element of the general plan..."

The use of Specific Plans by the City could be an important instrument in effectively reducing risk in certain areas and would be of value by demonstrating in advance to potential developers the specific risk conditions to be met prior to development. In other words, the City itself can determine the specific land use pattern for a given area as a function of risk rather than leaving the developer to do so within the context of local adopted regulations and codes.

BUILDING CODES

Building codes are a very useful technique for effecting risk reduction. The City of Coronado has adopted the 1973 Uniform Building Code, and the Building Department follows the Recommended Lateral Force Requirements and Commentary prepared by the Structural Engineers Association of California.



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